REMARKS

Claims 1-40 are pending in the current application. In an Office Action dated August 20, 2007, the Examiner rejected claims 1, 2, 20, 21, 22, and 40 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 7,186,355 ("Swager"); rejected claims 3 and 23 under 35 U.S.C. 103(a) as being unpatentable over Swager; rejected claims 1-3, 20-23, and 40 under 35 U.S.C. 103(a) as being unpatentable over IBM Tech Disclosure NN890244 Vol. 31, No. 9, pages 444-450 ("IBM") in view of U.S. Patent Application 2003/0112564 ("Granstrom"); rejected claim 1 under 35 U.S.C. 103(a) as being unpatentable over *J. Am. Chem. Soc.* 1990, 112, 4192-4197 ("Hush") in view of Granstrom. The Examiner objected to claims 4-19 and 24-39 as being dependent upon the above rejected base claims. Applicant's representative respectfully traverses these rejections.

Rejections under 35 U.S.C. 102(e)

According to M.P.E.P. 2131, in order for Swager to anticipate claims 1, 2, 20, 21, 22, and 40 under 35 U.S.C. §102(e), Swager must teach each and every element as set forth in the claims, and the identical invention must be shown in as complete detail as is contained in the claims. Swager does not teach each and every element of the independent claims 1 and 21.

Swager describes a number of different kinds of molecular devices. However, none of these devices alone anticipates the molecular switch recited in claims 1 and the method of claim 21. In an attempt to argue that Swager anticipates the molecular switch and method presented in claims 1 and 21, the Examiner has instead cited disparate portions of molecules and molecular devices of Swager.

The Examiner contends that Swager discloses a molecular switch in which a molecule is placed between two electrodes in col. 5, lines 7-10 and lines 38-42. However, col. 5, lines 7-10 provided a brief description of Figure 26 of Swager, which shows a schematic representation of a particular kind of polymer wire attached at both ends to two electrodes. Applicant's representative would like to direct the Examiner's attention to a more detailed description of the molecular device shown in Figure 26 of Swager which is provided in col. 6, lines 18-43. Figure 26 of Swager shows that the polymer wire includes receptor sites 156A-156E. These receptor sites are used to control the resistance of the wire and, in turn, control the flow of current between the electrodes 152 and 153. For example, Swager states "[b]inding of

analyte 159 by receptor 156D adds resistance to the wire, as schematically indicated by energy 160." In other words, the flow of current, or electron charge transfer, is controlled by binding analytes to the receptor sites of the polymer wire. The polymer wire is not operated by applying an electric field as is described in claims 1 and 21.

The Examiner contends that a molecule, which is not the same molecule of shown in Figure 26, has a change in conformation or conjugation from the delocalization of electric charge with extended conjugation as cited in col. 5, lines 43-48, col. 7, lines 62-67, and col. 21, lines 29-34. The organic group cited in col. 7, lines 62-67 of Swager is capable of changing conformation ***upon*** charge transfer. In other words, Swager is not applying an electric field to cause the conformation change of the organic group. Swager is describing applying charge transfer or a current which, in turn, causes the conformation change. There is no mention anywhere in Swager of applying an electric field to bring about a conformation change of a switch molecule. The conjugation referred to in col. 21, lines 29-34 does not relate to the change in conjugation referred to in claims 1 and 21. The Examiner cites in col. 21, lines 29-34 the last two sentences of a paragraph that begins with line 22 of col. 21. As stated in the first sentence on line 22, this paragraph describes electropolymerization and cyclization. Polymerization is a process of bonding a number of monomers (i.e., single molecular units) together to form a longer chain molecule called a "polymer." Cyclization is the same process but the monomers are bound together to form a molecular ring or cyclic polymer. The paragraph of col 21, lines 22-34 describes polymerization and cyclization using the thiophene groups, shown in Figure 17, as monomers. Thiophene groups can be bonded together to form a polymer in one of two fashions, either through the α-position or β-position to the sulfur atoms, as shown in Figure 17. Swager describes cyclization as proceeding through the less reactive β-position, and that polymerization can occur through the α-position. In both cases, the band gaps associated with the resulting polymers are determined by the α- and β-position of the monomers. In other words, the band gaps are associated with the α- and β-position of the monomers used to form the polymer and cyclic polymers. There is no mention anywhere in col. 21, lines 22-35 of applying an electric field to induce a change in the conjugation molecules or band gap of a molecular switch, as is taught by claims 1 and 21.

Finally, there is no mention in Swager of a molecule or method whereby applying an electric field induces a band gap change that occurs via molecular folding or stretching of the molecule.

Claims 2 and 20 depending from claim 1 and claim 22 and 40 depending from claim 21 are also allowable due to depending from allowable base claims and further in view of the additional limitations recited in these dependent claims.

Rejections under 35 U.S.C. 103(a)

In order "[to] establish *prima facie* obviousness of a claimed invention, ***all*** the claim limitations must be ***taught or suggested*** by the prior art." *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974) (emphasis added).

The Examiner rejected claims 3 and 23 under 35 U.S.C. 103(a) as being unpatentable over Swager. In particular, the Examiner contends that it would have been obvious to one of ordinary skill in the art at the time of the invention that the disclosure made by Swager encompasses a molecule with stator and rotor portions because Figures 19 and 20 of Swager show molecules having groups which can rotate. The molecules shown in Figure 19 are ***monomers*** that can be used to form ***polymers*** that Swager describes in EXAMPLE 10. These monomers do not include stator and rotor segments. There is no mention anywhere in EXAMPLE 10 of the monomers shown in Figure 19 including stator or rotor groups. Applicant's representative suggest that the Examiner read the description associated with Figures 17 and 19, which is given in col. 21 of Swager. The molecules in Figure 20 show the separate macrocycle and dumbell portions of two kinds of rotaxane molecules. These molecules also do not include stator and rotor portions. Applicant's representative suggests that the Examiner read a general description of rotaxane molecules, which can be found at http://en.wikipedia.org/wiki/Rotaxane.

The Examiner cited Granstrom in order to support of the Examiners *prima facie* case for obviousness. However, Granstrom post dates the filing date of the current application. The Examiner contends that although Granstrom does not predate the filing date of the current application, Granstrom need not do so because Granstrom ***shows*** a universal scientific fact (see M.P.E.P. §2124). Although the Examiner does not state what this universal scientific fact is, Applicant's representative believes the Examiner may be contending that Granstrom's statement in paragraph 0055 that conjugated molecules conduct current ***shows*** a universal scientific fact.

Applicant's representative contends that the Examiner has misapplied M.P.E.P §2124. M.P.E.P. §2124 is directed to references or publications that ***show*** factual evidence. In particular, M.P.E.P. §2124 states that "[i]n certain circumstances, references cited to ***show*** a universal fact need not be available as prior art," and "some specific examples in which later publications ***showing*** factual evidence can be cited include . . . ." The M.P.E.P in §2124 then proceeds to describes those instances where it is appropriate to apply references that post date the current application. However, paragraph 0055 of Granstrom is merely a statement and does not show a universal scientific fact. Granstrom also does not fall into any of the instances stated in M.P.E.P. §2124 where it is appropriate to apply references that post date the current application. Therefore, if the Examiner wants to provide a reference in accordance with M.P.E.P §2124, this reference must show or present factual evidence supporting Granstrom's statement in paragraph 0055 or Granstrom itself must provide this factual evidence, which is does not. Applicant's representative contends that because Granstrom post dates the current application and does not include any factual evidence or data in support of paragraph 0055, the Examiner does not have a basis for using Granstrom. In other words, the Examiner has not been able to establish that the single statement alone in paragraph 0055 is indeed a universal scientific fact.

The Examiner rejected claims 1-3, 20-23, and 40 under 35 U.S.C. 103(a) as being unpatentable over IBM in view of Granstrom. Applicant's representative contends that claims 1-3, 20-23, and 40 are patentable over IBM in view of Granstrom..

The Examiner contends that the conjugated molecule taught by Granstrom could be subjected to the electric field produced by the electrodes of IBM. In paragraph 0055, Granstrom states the following:

> "In one embodiment of the above method, the selected organic molecules have a phenol group between two opposing thiol-capped alkyl chains. Derivatizing such molecules by changing the bonding of thiol-capped alkyl chains from sp3 hybridized orbitals to sp2 hybridized orbitals allows for conjugation, and thus a greater relative conductance through the derivatized molecules."

Granstrom is describing in paragraph 0055 a specific kind of conjugated molecule which is "a phenol group between two opposing thiol-capped alkyl chains," but Granstrom does not teach or suggest how this particular conjugated molecule exhibits any of the limitations of claims 1 and 21. Applicants' claimed switchable molecules belong to "$Conj_1$-B-$Conj_2$" type of

structure. The "$Conj_1$" and "$Conj_2$" represent two conjugated molecular fragments and the "B" here represents either a single bond or an unsaturated hydrocarbon chain to link both conjugated molecular fragments together. Applicants change the molecular electronic and optical properties by changing "B". The ways used to change "B" or to change the extended conjugation of the molecule are by (1) changing the molecular conformation via bond rotation or molecular folding or stretching; (2) an isomerization; or (3) chemical bonding change from sigma-bond to pi-pond to change the band gap. In one switch state, Applicants' molecules are ***fully*** conjugated (*i.e., pi electrons are delocalized over the entire molecule*), while in another switch state, that conjugation is altered (*i.e., pi electrons are localized to regions of the molecule*); see, *e.g.*, paragraphs 0081 and 0083. No such change takes place in the molecule disclosed by Granstrom in paragraph 0055. Indeed, it is unclear to one skilled in this art whether the specific molecule of paragraph 055 is capable of such localization-delocalization of pi-electrons upon application of a switchable external field.

There are also distinct operational differences between IBM and Granstrom. IBM teaches applying an electric field to molecular systems, while Granstrom teaches subjecting molecules to a magnetic field induced by two magnetic layers. "If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claim *prima facie* obvious." (see M.P.E.P §2143.02 VI.) Electric and magnetic fields are different physical phenomena and their effects on molecules are often quite different. Therefore, one skilled in the art would immediately recognize that applying an electric field to the molecule Granstrom describes in paragraph 0055 may not induce the same physical response Granstrom obtains when that same molecule is subjected to a magnetic field. Just because Granstrom teaches the use of a specific conjugated molecule in paragraph 0055, the Examiner cannot be certain that this molecule is also suitable as a molecule in a molecular switch that is operated using a switchable electric field.

Claims 2, 3, and 20 and depending from claim 1 and claims 22, 23, and 40 depending from claim 21 are also allowable due to depending from allowable base claims and further in view of the additional limitations recited in these dependent claims.

Although the Examiner stated that claim 1 is rejected under 35 U.S.C. §102(b) as being anticipated by Hush in view of Granstrom, Applicant's representative assumes that

the Examiner actually meant that claim 1 is rejected under 35 U.S.C. §103(a) as being unpatentable over Hush in view of Granstrom.

Applicant's representative contends that claim 1 is patentable over Hush in view of Granstrom. The Examiner here also contends that the conjugated molecule taught by Granstrom could be subjected to the electric field taught by Hush. Applicant's representative asserts that claim 1 is patentable over Hush in view of Granstrom for the same reasons provided above for IBM in view of Granstrom.

In Applicant's representative's opinion, all of the claims remaining in the current application are clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,
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